DTS
DEPARTMENT OF TECHNOLOGY SERVICES

# TECHNICAL ARCHITECTURE REVIEW

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| **Project Name:** | **Open Enterprise Server (OES)** |
| **Requestor:** | Kevin Van Ausdal |
| **Date of Initial Request:** | November 19, 2007 |
| **Request Description:** | What are the States planned directions for file and print services and the implementation of Open Enterprise Server from Novell |
| **Agency or Agencies:** | Utah Tax Commission, and the State Enterprise |
| **Reviewers:** | Bob Woolley and Dave Fletcher |
| **ARB Acceptance Date:** | |
| **Agency Requestor Acceptance Date:** | |

## Introduction and Background

This review is based upon a request for future directions for file, print, and other related services within the State of Utah. The majority of these services are now provided through NetWare, however, Netware support will end in 2015 and Novell is encouraging customers to migrate to Open Enterprise Server (OES). This migration presents a number of costs and potential benefits.

Migration to OES presents the State a decision point with multiple alternatives. Consideration and direction for ongoing use of the Novell environment and possible migration to Windows Server and Active Directory have been considered.

## Objectives and Scope of Review

File and print services touch, and are interdependent with, many other technologies. The scope of this review is limited primarily to migration from Netware file and print to the Linux Open Enterprise Server (OES) environment. Alternative approaches, such as Active Directory, are discussed but are not analyzed on a detail level. The review does address many of the dependencies that must be considered when migrating from Netware to OES.

## Baseline of Current Architecture

Netware Servers[1] currently deployed at the State of Utah as of December 4, 2007, are as follows:

| | | |
|---|---|---|
| Total NetWare 4.x Servers | 0 | |
| Total NetWare 5.x Servers | 18 | 4.9% |
| Total NetWare 6.0 Servers | 35 | 9.5% |
| Total NetWare 6.5 Servers | 314 | 85.6% |
| **Total Netware Servers** | **367** | |

Data on server distribution was taken from eleven Novell eDirectory Trees identified by LMS. Actual OES implementations are limited to some test instances, with no production servers.

## Opportunity Assessment

OES offers a substantial opportunity to reduce the number of NetWare servers under management that provide file, print, and other network services. NEXCOM used OES[2] to consolidate management from 45 servers to 10. If the State could go from 367 down to 100 or fewer servers there could be a large savings in hardware and the opportunity to redirect personnel time to higher value IT needs.

Additional opportunities are evident based upon the services provided in OES compared to the NetWare 6.5 environment. Capability differences between the environments that are of potential value to the State include the following:

| **Content and Application/Open Source Service** | **OES** | **NW6.5** |
|---|---|---|
| SUSE Linux Enterprise Server 10 | Yes | No |
| Mono | Yes | No |
| JBoss | Yes | No |
| SOAP Server | Yes | No |
| UDDI Server | Yes | No |
| XEN Virtual Machine | Yes | No |
| **Networking and Productivity Services** | **OES** | **NW6.5** |
| Novell Client for Vista | Yes | No* |

[1] *Novell LMSCHECK Tool Audit Report*, December 4, 2007.
[2] *Novell Delivers Open Enterprise Server 2 with Proven Networking Services on Linux*, http://www.novell.com/news/press/novell-delivers-open-enterprise-server-2-with-proven-networking-services-on-linux.

| **Management Services** | **OES** | **NW6.5** |
|---|---|---|
| Domain Services for Windows | Yes | No |
| Storage Resource Management | Yes | No |
| Global Server Management | Yes | No |

| **Other Services** | **OES** | **NW6.5** |
|---|---|---|
| Dynamic Storage Technology | Yes | No |
| Snapshot Backup | Yes | No |
| Support for more than 4G of RAM | Yes | No |
| 64-bit CPU Support | Yes | No |

*NetWare 6.5 Service Pack 7 provides a Vista client with some functionality limitations.

## Best Practices Review

Earlier network operating systems, such as Netware, focused heavily on decentralized administration and deployment, and in the case of file and print services, implementation tended to favor local management and control in a context of limited bandwidth. It was not practical to manage and deliver file and print services from remote locations; the latencies were too great. Bandwidth is still a limiting factor in some locations, and many of these may still require remote instances for file and print services. The overall DTS direction to increase bandwidth enables new opportunities for customers and management of network services.

The best practices, irrespective of vendor, may be summarized as follows:

- Use as much centralized management and deployment as is practicable.
- Optimize bandwidth to enable the use of existing and new network service offerings.
- Consolidate and reduce the number of network servers under management.
- Utilize network operating system environments that support open standards and minimize technology specific proprietary services.
- Ensure that network services are delivered in a secure environment that respects privacy and minimizes risks for network users.

Associated with these practices is provisioning of many other network services that go well beyond the traditional file and print service offerings. Examples include:

- Content and application services: Virtualization and Web services integration.

- Support for multiple network clients: Vista, Windows XP, Linux, OS X, etc.
- Management Services: Domain, global service, and storage management.
- Storage services: Desktop backups, dynamic storage allocation and management, and user managed backups.

## Emerging Technologies and Trends

The Novell strategy consists of encouraging customers to migrate applications from the NetWare platform to SUSE Linux while giving them the option of running those applications on NetWare for as long as they want. Novell also intends to leverage virtualization technology so applications will look like they're running on NetWare while actually running on Linux.

Novell's market share has dropped to less than 17% in corporate and government accounts, with the vast majority of customers migrating to the Microsoft Active Directory environment. Existing large Novell customers have shown a high degree of loyalty to remaining with Novell. While OES is clearly the companies announced strategy, NetWare support will continue through 2015. Migration decisions in this area are influenced by added functionality, and the capability of the existing technical support base within an organization. Organizations do not migrate to new technologies without well defined benefits. This perhaps offers insight into why Novell's larger customers have been slow to migrate to alternate options.

## Alternative Analysis

There are four apparent options available to the State regarding NetWare migration and related services:

- **As-is Environment**—Do nothing but maintain the current environment with an agency option plan for OES migration.
- **Mixed Environments**—Allow agencies to select NetWare through 2015, or migrate to OES or Windows Server and Active Directory.
- **Complete OES Migration**—Migration of existing NetWare servers to OES under a specified project timeline, or alternatively, as existing servers reach their end of life.
- **Windows Server and Active Directory Migration**—Migration of existing NetWare servers to the Windows Server and Active Directory environment with a specified project timeline.

## Benefit and Gap Analysis

**As-is Environment**—This option presents no real enterprise value and an attenuated implementation and time to benefit.

**Mixed Environments**—This option presents the greatest complexity for the State and perhaps the least benefit from an enterprise perspective. This option presents many issues for synchronization of directory information and a common approach for file and print services. The biggest gap for this option is a wide array of unknown dependencies and integration challenges with existing platforms and applications.

**Complete OES Migration**—This option requires the migration of the existing 367 NetWare servers to what would hopefully be a smaller number of OES servers. This option has limited licensing cost impact but does have a labor cost impact and a potential hardware replacement impact for an unknown number of the existing NetWare servers. Implementation time and the resultant time to benefit could likely be achieved in six months or less. Costs are primarily personnel and planning time. This option provides potential benefits with cost savings and avoidance for other infrastructure such as UDDI, virtualization, and storage management. This option requires some Linux training in agencies, but the training requirement is minimal; existing skill sets are easily leveraged. For this approach to be advantageous to the State, the OES migration and deployment must be planned in advance, with a goal of reducing the total number of servers requiring management.

**Windows Server and Active Directory Migration**—This option presents advantages from a shrink wrap application interoperability perspective, and is the most consistent with the direction of many external business vendors. Implementation would be complex and require significant resources for planning and training of personnel. Of all of the options this is by far the most expensive, with impacts on licensing, maintenance, and personnel costs. Directory integration with existing internal applications would require potential changes to more than 200 applications.

## Financial Analysis

There are no known procurement issues with either Microsoft or Novell alternatives. For costing purposes, the complete OES migration has been compared to a complete Active Directory migration. The as-is, or leave the environment alone, option does not represent a significant fiscal cost but does represent an opportunity cost. The mixed environment option is complex from a cost perspective and at this point would have to be based on unsubstantiated assumptions, so no cost analysis has been applied to this option.

**As-is Environment**—Costs for this approach include the fixed costs of the normal server replacement cycle and licensing cost increases as follows:

- Existing NetWare Licensing: $23.32 Annual X 367 = $8,558
- Existing likely server replacement costs 367 X $5,500 = $2,018,500
- OES NetWare Licensing: $56.20 Annual X 367 = $20,625

These cost assumptions assume a one for one replacement of NetWare servers with no consolidation as a worst case scenario. This analysis shows a licensing cost increase of $12,067.

**Mixed Environments**—Costs for this approach are harder to estimate. The existing cost base for NetWare of $8,558.44 would be replaced with a phase-in of OES or Windows Server/Active Directory costs over a probable three to five year period. Base licensing costs will increase, but there are multiple unknown cost factors such as:

- rate of replacement with OES or Windows Server/Active Directory;
- ongoing UMD integration with Active Directory Servers;
- management of a server number that is likely to be higher initially than the current base of 367 servers;
- application integration costs with existing applications that require directory services; and,
- unknown costs for management of a mixed environment for file, print, and other related services.

**Complete OES Migration**—OES migration presumes a planning activity that targets future deployment environments, with server consolidation as a key objective. Leverage of integrated OES features, such as the UDDI and virtualization, offer other benefits, but they are not considered for costing purposes. Based on the experience of other companies and input from Novell, it is estimated that the current 367 server environment could be reduced to 200 or fewer OES servers. If that proves to be correct, the fixed cost assumptions are as follows:

- Existing NetWare Licensing: $23.32 Annual X 367 = $8,558
- Existing likely server replacement costs: 367 X $5,500 = $2,018,500
- OES NetWare Licensing: $56.20 Annual X 200 = $11,240
- OES server costs: $5,500 X 200 = $1,100,000

  Total OES Fixed Costs: $1,111,240

This yields a license cost increase of $2,682 per year, which is minimal. Server cost savings with a planned OES migration are approximately $918,000. OES and NetWare run on approximately the same class of server, so there is no differential based on operating system environments.

**Windows Server and Active Directory Migration**—Migration to Windows Server/Active Directory is an option that needs to be considered for a variety of reasons. A complete and accurate cost comparison is not possible without some detailed analysis of the final deployment architecture. Costs are analyzed based upon a total migration and do not consider a phased implementation approach which impacts timelines and variable costs, but not fixed costs. Basic fixed costs that have been identified under our existing contracts are as follows:

- Existing likely server replacement costs as estimated by En Point and Microsoft at about 80% of the existing NetWare environment, or 295 X $5,500 = $1,622,500.
- Windows Server Licensing: 200 X $696.24 = $139,248. This licensing assumes a standard license with software assurance. Enterprise licensing is $2,261 per server, or a total of $453,200.
- Client Access License (CAL): 22,000 X $27.96 = $615,120. This assumes software assurance for each CAL.

  Total Fixed Costs: $2,376,868 to $2,690,820

Variable cost considerations and impacts include:

- probable e-mail replacement to Outlook;
- staff training for Windows Server and Active Directory;
- UMD integration and/or replacement with Active Directory;
- application integration for at least 248 internal applications that use the existing UMD environment; and,
- security costs to adequately protect the server and directory environment.

Ongoing savings include improved integration and synchronization of remote devices such as smart phones and PDAs. Directory integration with many commercial software packages will be easier if the vendor already supports Active Directory.

## Security Review and Analysis

Of the options discussed, security must be considered for all of them, especially on a server level. The Microsoft solution requires additional consideration since this environment is heavily targeted by many forms of malware and hacks.

## Operational and Infrastructure Analysis

The migration to OES seems to place the smallest burden on DTS from an operational perspective. Significant planning time is needed to identify the target environment and create a phased implementation plan. Aside from the need for some possible additional Linux training, the OES migration option is likely to cause the least disruption to existing services.

**Dependencies**
OES migration is dependent upon the following software requirements:

- eDirectory 8.8
- Zen 7.01
- DS 8.7.3 or greater

About 38 servers must be upgraded to DS 8.7.3. Curtis Parker[3] has suggested a target implementation date of March 3, 2008 for agencies to install:

- the latest support pack for the OS. (5.1, 6.0 or 6.5);
- eDirectory 8.7.3; and,
- the eDirectory 8.7.3.9 update.

Once these upgrades are completed, eDirectory 8.8 can be installed at the root of the directory tree, and the State is in a position to begin migration to OES.

**Training**
Approximately 30 plus NetWare administrators have already been trained on Linux. An assessment of who else needs training will be needed.

## Solution Delivery Impact and Analysis

OES migration has a minimal impact on solution delivery.

## Agency Services Impact and Analysis

OES migration has a minimal impact on Agency Services; however, there will be time requirements for OES planning and server implementation.

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## Summary and Recommendations

From a least cost and complexity perspective, it is recommended that the State move forward with OES migration for all existing NetWare servers.

- Designate a team to plan the migration and establish server replacement goals that are consistent with anticipated server obsolescence.

- Migrate Capitol Hill agencies as a practical test of OES migration procedures, together with other agencies that are ready for migration. Document the results and make them available to all agencies.

- Designate a team to review other possible benefits from OES, such as the UDDI, virtualization, etc., and make recommendations for use and adoption.

OES migration should take place with the least cost to the State but fast enough that OES benefits can be realized across the enterprise. OES and NetWare can co-exist, so there is no compelling reason to upgrade all servers ahead of their normal life cycle unless, in the planning process, server consolidation is enhanced by faster OES migration. There is a potential savings in server costs of over $918,000, and when licensing and server management are considered, this represents more than $1,000,000 in potential cost savings if the migration is planned with server consolidation in mind.

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